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Research Note

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

INTERMOUNTAIN FOREST & RANGE EXPERIMENT STATION
OGDEN UTAH

U.S. Forest Service
Research Note INT-19

1964

CALCULATING THE NATIONAL FIRE-DANGER RATING SPREAD INDEX BY COMPUTER

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ABSTRACT

Changeover from use of the Intermountain Model-8 Burning Index Meter to use of the Spread Index of the National Fire-Danger Rating System required a comparative analysis of both systems. This note describes a program written in SPS to calculate various indexes of both systems on an IBM 1620 computer.

Throughout the United States many forest fire protection agencies are now or soon will be using the Spread Index of the National Fire-Danger Rating System. Changing from one danger rating system to another is not a simple matter of substituting the new for the old. Some type of analysis must be used to aid in establishing the relation between the old system of danger rating and the new system. Information gained from such an analysis is essential in revising existing fire plans and manning and action guides or in designing new ones. Field personnel can use the new system more readily when they understand how it functions in comparison to the system they have been familiar with. Through analysis and conversion, relative indexes begin to take on real meaning and are no longer just numbers but something tangible to the user.

The Northern and Intermountain Regions of the U.S. Forest Service were confronted by the problem of changing from the Intermountain Model-8 Burning Index Meter to the Spread Index of the National System. Since all presuppression and suppression activities in these two Regions were geared to the 9 years of experience with the Model-8 Meter, a simple substitution of systems was not desirable. The experience and knowledge gained while using the Model-8 System could not be ignored. Comparing elements of past fire seasons, rated under the old system, to the National System ratings would provide a basis and background for converting. Automatic processing would facilitate rapid and accurate calculations from data collected by fire-weather stations over many years. With these conditions in mind, a computer program was written to calculate the National Fire-Danger Rating System Spread Index.

The computer program was originally written to calculate both the National and Model-8 Indexes simultaneously. However, this program can be modified to calculate only the National System Spread Index. The program was designed to utilize the readily available U.S. Weather Bureau Fire-Weather Record punchcards, Form 612-17 (formerly 1009-E). The information needed to compute the indexes for the National System with the possible exception of Herbaceous Stage is on these Weather Bureau punchcards.

Input data necessary for computing the National Spread Index are:

1. Dry Bulb Temperature
2. Wet Bulb Temperature
3. Wind Speed
4. 24-Hour Precipitation

One remaining item of input necessary to compute the Spread Index is the Herbaceous Stage. Most of the fire-weather stations in the Intermountain area did not observe and record information about condition of vegetation. Therefore, the program was written with provisions for calculating the indexes by using preselected dates to show changes in the various stages of curing. The program can also be run using the same vegetative stage throughout the season.

Program output includes all of the input information for each day plus the following:

1. Fine Fuel Moisture
2. Adjusted Fuel Moisture
3. Buildup Index
4. Fine Fuel Spread Index
5. Spread Index (timber)

Once the output information is available on cards, numerous methods of analysis are possible. Individual factors or combinations of several factors can be compared and correlated to the causes, sizes, number, and growth of fires, and difficulty of suppression. Results from these comparisons can be used to revise plans for manning and action and also to provide field personnel with the essential relations between the old and new rating systems.

The program has been written in the Symbolic Programming System (SPS). Table look-up is the basic method of determining the various indexes. Machine results are identical to those determined by using the U.S.D.A., Forest Service, National Fire-Danger Rating System, Spread Phase 5100-26 (5-63) Forest Fire-Danger Tables 1 to 6. The program was written specifically for an IBM 1620 computer with a 40 K storage capacity, indirect addressing, and hardware divide.

This computer program was written under a contract with the University of Idaho Computer Center by Dr. H. Ward Crowley. A copy of the program titled, "Program to Compute Model-8 Burning Index and National Spread Index," a writeup of operating instructions, a program card deck, or more detailed information may be obtained on request to Dr. H. Ward Crowley, Computer Center, University of Idaho, Moscow, Idaho. General information concerning this program may also be obtained from the Northern Forest Fire Laboratory, Missoula, Montana.